PCT/AU03/01239

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Patent Office
Canberra

I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002951618 for a patent by NOBLE HOUSE GROUP PTY LTD as filed on 25 September 2002.

WITNESS my hand this
Eighth day of October 2003

JONNE YABSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

COMMONWEALTH OF AUSTRALIA

Patents Act 1990

PROVISIONAL PATENT SPECIFICATION

Application No.

Application Date:

Applicant: Noble House Group Pty Ltd
41-45 Tennant Street, Fyshwick, ACT, Australia

Actual Inventors: William Leonard MOBBS
Jagmohanbir Singh DILLON

Address for Service: Noble House Group
PO Box 139
Fyshwick ACT 2609

Invention Title: Means for Compressing Tubes and the Like

The invention is described in the following statement: -

TITLE: MEANS FOR COMPRESSING TUBES AND THE LIKE

TECHNICAL FIELD

This invention relates to devices and methods for use in compressing hollow flexible tubes to express matter contained therein. It is particularly, but not exclusively, suited to stripping blood from tubes that are connected to blood packs.

BACKGROUND

Our prior international patent application PCT/AU01/0400 disclosed devices and methods of this nature, with particular application for the stripping of blood lines. It also reviewed relevant prior art and the uses for such devices. The devices disclosed in our prior application were hand-held and self-powered. They worked well but improvements have been devised that extend their scope of application and have wider applicability.

OUTLINE OF THE INVENTION

The present invention follows the basic design disclosed in our prior patent in that it has a pair of rollers that can be brought together to form a nip through which the tube can be drawn by driving one or both of the rollers. The axes of the rollers are substantially parallel when forming the nip and, preferably, remain parallel as they are moved together and apart. For convenience, one roller remains fixed with respect to the frame of the device and the other is movable to and from the fixed roller to close and open the nip. As is conventional in rolling mills and calendaring devices, the axes of the rollers of our prior application always remained in a plane that was orthogonal to the direction of travel of the material being rolled. However, according to an improvement now disclosed, we prefer the axes of the rollers to be displaced from one another in the direction of the tube travel; that is, the plane that contains the two roller axes does not remain orthogonal to the tube travel when the rollers are moved together and apart. The movable roller may travel in direction that is substantially orthogonal to the direction of material travel, in a direction that is substantially parallel to the direction of material travel, or in any direction there between. When the nip is formed, the plane containing the axes of the rollers may be orthogonal to the direction of material travel or angled with respect thereto. We have found that this way of forming the nip allows better grip of the tube for the

same nip closure and permits simpler and more robust mounting of the movable idler roller. Our preferred arrangement is to have the moving roller travel substantially parallel to the tube axis – ie, the direction of material travel – to form the nip.

We prefer to provide a guide for the tube or other material, on one or both sides of the nip, to keep it in place between the rollers during operation of the device. This is particularly desirable when using an 'angled nip' (that is, one in which the common plane of the rollers is angled with respect to the direction of material travel through the nip. With an angled nip, the axis of the material or tube will tend to align itself to a position in which the common plane is orthogonal to the direction of travel.

The driven roller is preferably supported by a bearing fixed to the main frame of the device and the shaft of the idler roller is preferably supported by a bearing that is mounted on a sub-frame slidably mounted on the main frame. Conveniently, the sub-frame can take the form of a yoke that straddles the axis of the driven roller, one arm of the yoke having a trunnion that mounts the idler roller and the other arm housing a leadscrew that is operated by the 'jaw' motor to move the yoke to and from the driven roller so as to bring the idler toward and away from the driven roller. Conveniently, the leadscrew may have a worm wheel fixed thereto for engagement with a worm that is driven by the jaw motor. This arrangement allows a robust and compact mechanism suited for using a wide variety of applications were tubes and the like are pulled through roller nips.

As before, an important application of such devices is the stripping of blood lines and, for that purpose, the stripper can be mounted on a bench or be hand-held. From another aspect, therefore, the present invention includes a device consisting of a body and two rollers external to the body. Contained within the body of the device is a jaw means for the purpose of opening and closing a nip point between the rollers, a driving means to rotate one of the rollers and a power source.

DESCRIPTION OF EXAMPLES

Having broadly portrayed the nature of the present invention, a number of examples will now be described with reference to the accompanying drawings, in which:

Figure 1 is rendering of a side view of the chosen example of a hand held device.

Figure 2 is a rendering of the opposite side view of the chosen example.

Figure 3 is a frontal rendering of the device showing the position of the guide and the rollers in the closed/compression position.

Figure 4 is a longitudinal perspective drawing of the internal mechanism of the example with the rollers in the closed/compression position.

Figure 5 is frontal perspective drawing of the internal mechanism of the example with the rollers in the open/load position.

Figure 6 (a) & (b) are front elevation drawings of the example showing the position of a length of tubing to be compressed before compression (a) and after compression (b). The direction of roller rotation, tube travel and device travel is also indicated.

One suggested application of the device was explained in detail in our previous application. Below is a description of the external features of the chosen example and a description of the improved mechanism for forming the nip between the rollers.

Referring now to Figures 1 to 3, the device depicted comprises of a hollow molded body 23 a front portion or head 24 and a rear portion or handle 26. The head 24 of the device houses the drive mechanisms for the rollers. The handle portion 24 houses a rechargeable battery set (not shown) which can be charged by inserting the male end of the appropriate charging adapter plug (also not shown) into the corresponding female socket at 22 (indicated but not visible). An indicating means, to alert the need to recharge the battery and also to indicate when full charge has

been achieved may also be included. Two soft grip areas 17 are molded into the surface of the body.

The external features of the device also include two rollers 10 and 12, and a guide 14. The two rollers are operated by the open/close button 16 which moves one roller towards and away from the other fixed roller and the start/stop button 18 which causes the fixed roller to rotate on its axis.

Referring now to Figures 4 to 6 a more detailed description of the improved mechanism and its operation follows.

The driven roller 10 is secured to a drive shaft (not shown) which extends from the planetary gearbox 48. The planetary gearbox is coupled directly to the drive motor 46. The idler roller 12 is mounted on a stub axle 33 which is supported by a trunnion bearing (not shown) secured in the sub frame 40.

The sub frame 40 is in the form of a yoke, which straddles the axis of the drive roller 10. One arm of the yoke houses the trunnion bearing while the other arm of the yoke houses the lead screw 34.

The idler roller 12 is moved towards and away from the driven roller 10 by activation of the jaw motor 44(partially shown). The jaw drive axle 43 extends from the jaw motor 44 and has worm gear 32 mounted at its distal end. The distal end of the jaw drive axel is supported by a bearing 35 mounted in the mainframe 37. Worm gear 32 is engaged with crown wheel 30. Crown wheel 30 is fixed to one end of the lead screw 34 the axis of which is orthogonal to the axis of the worm gear.

The lead screw 34 passes through the sub frame 40, which is internally threaded to accommodate the thread of the lead screw. The ends of the lead screw 34 are of a reduced diameter and penetrate the main frame at points 39 and 41. Bearings (not shown) support the lead screw at these same points. This arrangement fixes the position of the lead screw in relation to the sub frame 40 and ensures that during rotation of the lead screw the crown gear 30 remains engaged with worm gear 32.

Rotation of the lead screw 34 in one direction will cause the sub frame 40 to move along the length of the lead screw 34 away from the crown wheel. Rotation of the lead screw in the reverse direction will cause the sub frame 40 to move along the lead screw towards the crown wheel.

Travel of the sub frame 40 is guided by a support bearing (not shown) mounted on stub axel 33, immediately behind the idle roller 12. The support bearing is slidably mounted inside the keyway 36 and tracks along keyway edge 38.

Limit switches (not illustrated) may be included to automatically deactivate the jaw motor when the limits of travel of the idle roller have been reached.

Operation

The start position of the rollers is that depicted in Figure 6(a) that is in the open/load position. The flexible tubing to be compressed is placed under the guide 14 and between rollers 10 & 12.

When the jaw motor is energized by pressing the open/close button 16 (Fig 2) the jaw drive axel 43 rotates which in turn rotates the worm gear 32 attached to it's distal end. Because the worm 32 gear is engaged with the crown wheel 30 and the crown wheel is fixed to the lead screw 34, axial rotation of the worm gear in the horizontal plane, for example, is translated into axial rotation of the lead screw in the vertical plane.

Rotation of the lead screw causes the sub frame to move along the length of the lead screw. As the idler roller 12 is fixed to the sub-frame it is moved towards the driven roller 10 along the line A-B from the open/load position at Y to the closed/compression position at X. As the nip is formed at 20 the tubing will be compressed between the rollers at the same point.

The drive motor 46 is now energized by pressing the start/stop button 18 (Fig 2). After gearing through the planetary gearbox 48 the driven roller 10 is rotated in the direction shown.

This rotation of the drive roller propels the tubing through the nip point 20 in the direction of arrow D. Any fluid in the tubing19 will be forced out of its open end ahead of the nip point.

The operator, can expediate the process by "driving" the device along the length of the tube 19 in the direction of arrow C.

When the desired end point is reached the start/stop button 18 (Fig 2) is pressed to de-energise the drive motor. The open/close button 16 (Fig 2) is then pressed and the idler roller 12 is moved away from the drive roller 10 to the starting position Y. The tubing can now be released from the device.

The "tracking" of the tubing 19 during operation is maintained by the tube guide 14 which prevents the tubing escaping in a direction away from the body of the device and off the end of the rollers. The example could also include a second tube guide positioned opposite the existing tube guide 14 on the other side of the rollers. However, we have found that the single guide is sufficient and allows for easier loading of the tube between the rollers.

While this example illustrates one means of forming a compressive nip between two rollers it should be appreciated that many changes can be made to this example without departing from the scope of the mechanism as outlined above.

****

Noble House Group Pty Ltd
20 September 23, 2002

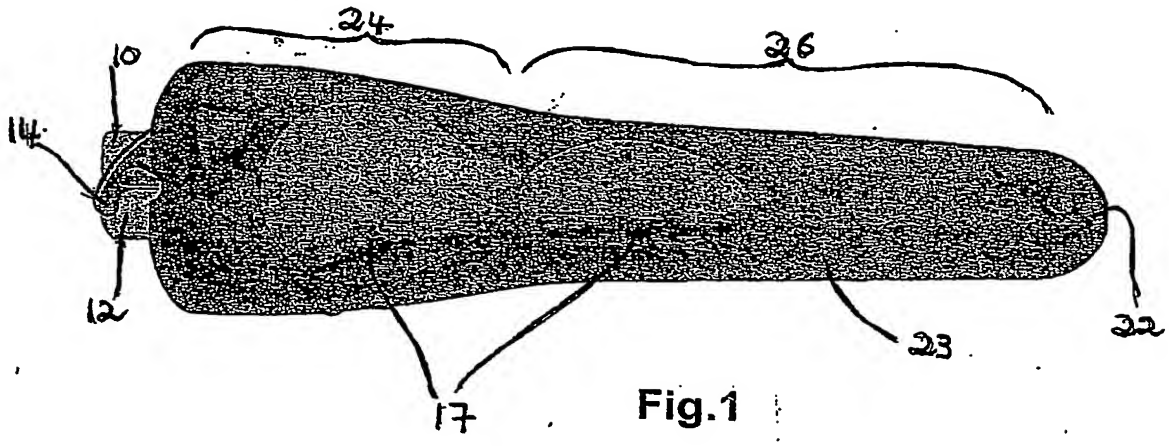

Fig.1

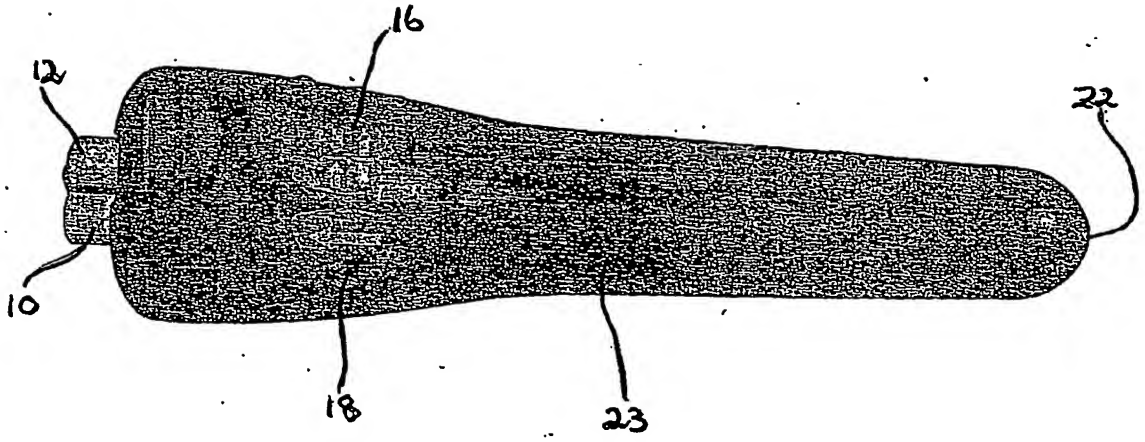

Fig.2

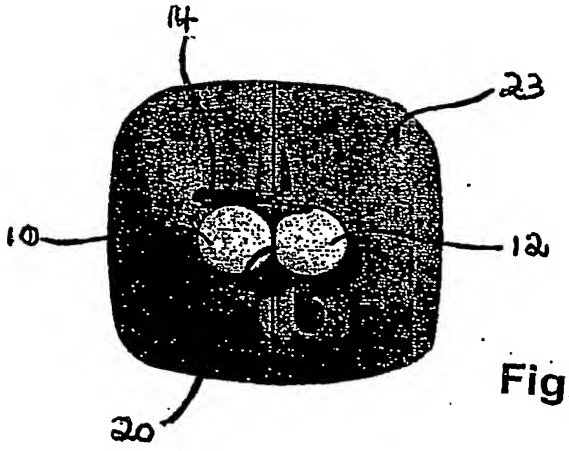

Fig.3

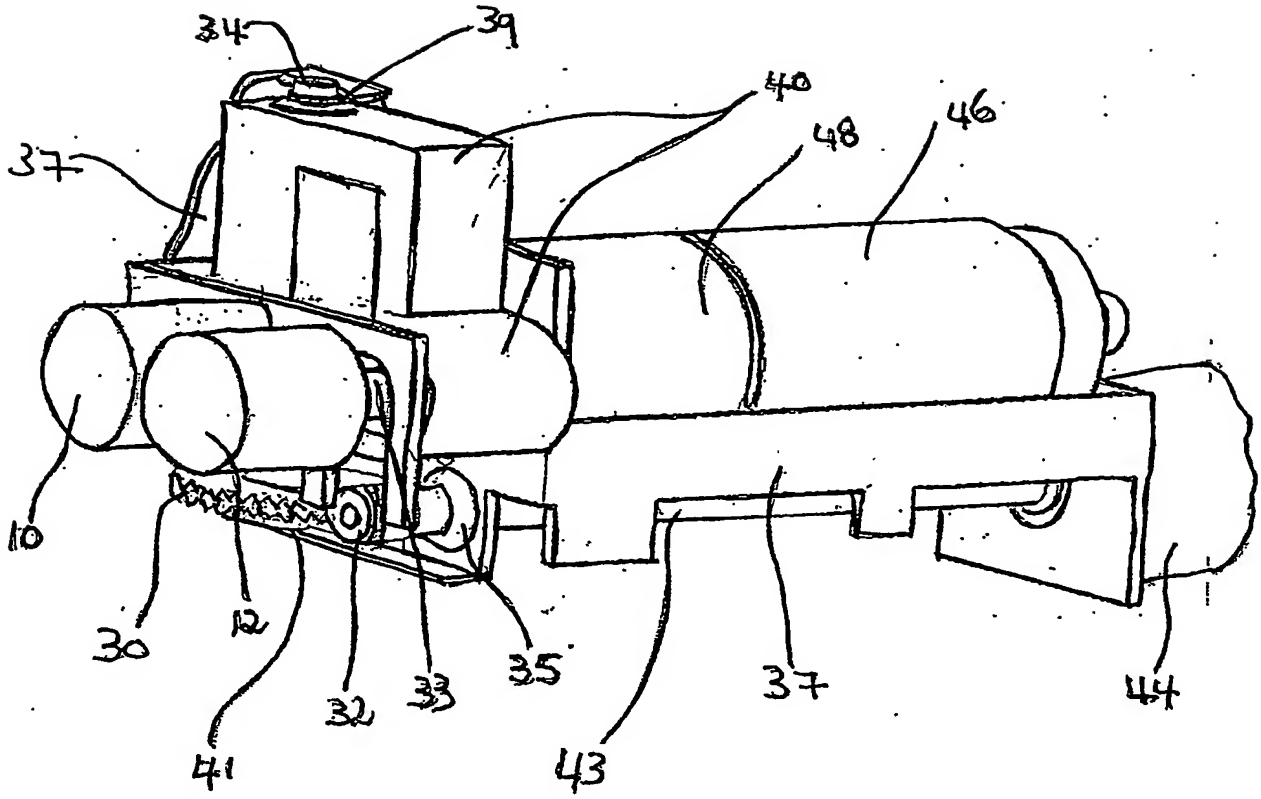

Fig.4

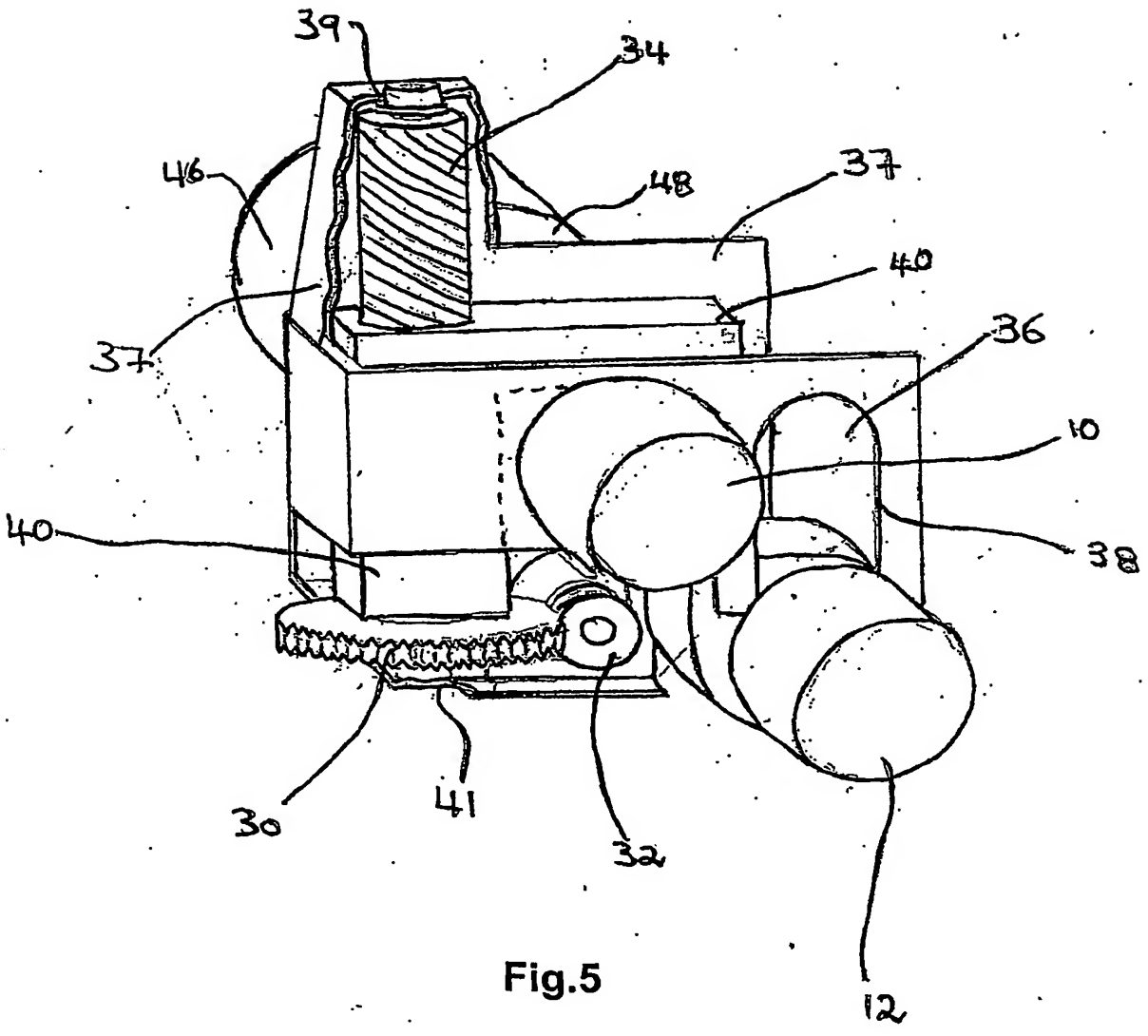

Fig.5

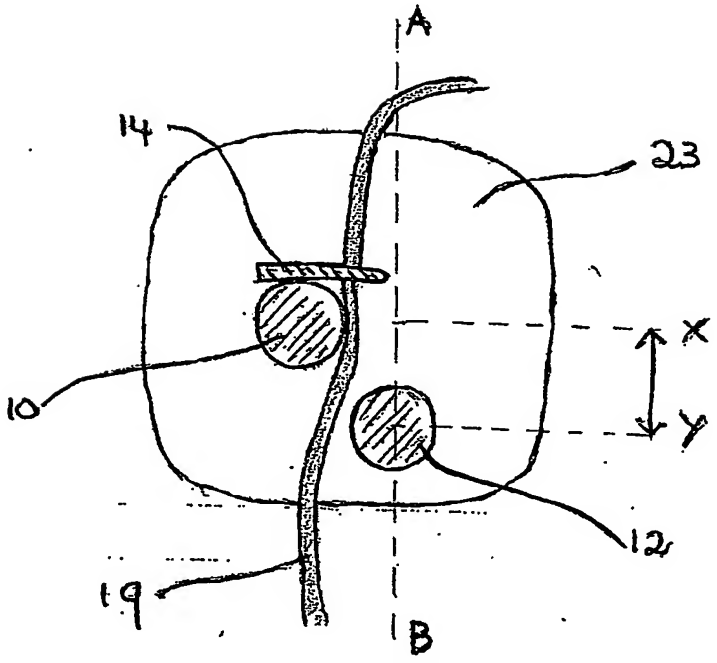

Fig.6(a)

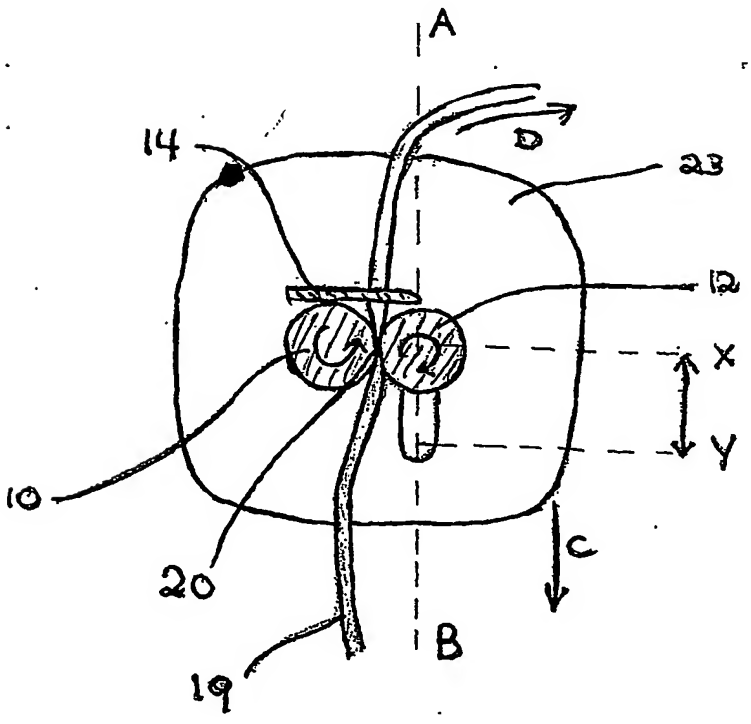

Fig.6(b)